Chemical Equations and the Mole

Consider the following reaction:

$$2\ KClO_3\ {}_{(s)} \rightarrow 2KCl\ {}_{(s)} + 3O_2\ {}_{(g)}$$
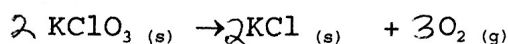
1. Balance the chemical equation. What type of reaction is this?

   Decomposition Rx.

2. What is the molar mass of $KClO_3$?

   $K = 1 \times 39.10\ g/mol = 39.10\ g/mol$

   $Cl = 1 \times 35.45\ g/mol = 35.45\ g/mol$

   $O = 3 \times 16.00\ g/mol = \underline{48.00\ g/mol}$

   $122.55\ g/mol$

3. Calculate the percent composition of oxygen, potassium and chlorine in $KClO_3$?

   $\% O = \dfrac{(3)(16.00\ g/mol)}{122.55\ g/mol} \times 100 = 39.17\%\ O$

   $\% K = \dfrac{(1)(39.10\ g/mol)}{122.55\ g/mol} \times 100 = 31.91\%\ K$

   $\% Cl = \dfrac{(1)(35.45\ g/mol)}{122.55\ g/mol} \times 100 = 28.93\%\ Cl$

4. Calculate the following amounts:

   a. What is the mass in grams of 0.450 mol of $KClO_3$?

$$0.450 \text{ mol } KClO_3 \left(\frac{122.55 \text{ g } KClO_3}{1 \text{ mol } KClO_3} \right) = 55.1 \text{ g } KClO_3$$

   b. How many moles of $KClO_3$ are in 2.71×10^{25} formula units* of $KClO_3$?

$$2.71 \times 10^{25} \text{ } KClO_3 \text{ f.u} \left(\frac{1 \text{ mol } KClO_3}{6.022 \times 10^{23} \text{ f.u}} \right) = 45.0 \text{ mol } KClO_3$$

   c. How many oxygen atoms are in a 4.20 g sample of $KClO_3$?

$$4.20 \text{ g } KClO_3 \left(\frac{1 \text{ mol } KClO_3}{122.55 \text{ g } KClO_3} \right) \left(\frac{6.022 \times 10^{23} \text{ f.u.}}{1 \text{ mol } KClO_3} \right) \left(\frac{3 \text{ O atoms}}{1 \text{ } KClO_3 \text{ f.u}} \right) = 6.18 \times 10^{22}$$
$$\text{O atoms}$$

*formula unit – the smallest, electrically neutral collection of ions in an ionic compound.